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मानक

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Mazdoor Kisan Shakti Sangathan

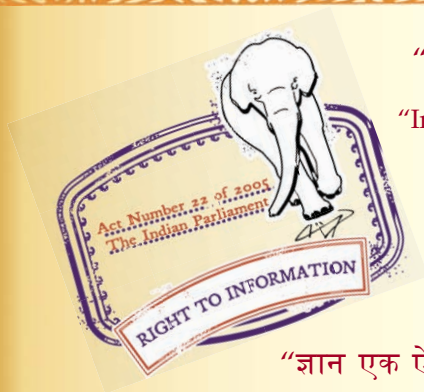
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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 14606 (1998): Irrigation equipment - Media filter [FAD 17: Farm Irrigation and Drainage Systems]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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REAFFIRMED 2004

IS 14606 : 1998

भारतीय मानक

सिंचाई उपस्कर — मीडिया फिल्टर — विशिष्टि

Indian Standard

IRRIGATION EQUIPMENT — MEDIA
FILTERS — SPECIFICATION

ICS 65.060.35

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 1998

Price Group 3

**AMENDMENT NO. 1 SEPTEMBER 2000
TO
IS 14606 : 1998 IRRIGATION EQUIPMENT — MEDIA
FILTERS — SPECIFICATION**

(*Page 1, clause 3.1, second sentence*) — Substitute the following for the existing sentence:

‘Each media filter is contained within a pressure vessel(s) or tank(s) having service opening at the top and/or side, inlet, outlet and backflush connections that contains underlying drains.’

(*Page 2, clause 4.1.4*) — Insert the following new clause:

‘4.1.5 Media filter shall be provided with measuring points at inlet and outlet for pressure measurement.’

(FAD 54)

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 2 MAY 2002
TO
IS 14606 : 1998 IRRIGATION EQUIPMENT — MEDIA
FILTERS — SPECIFICATION**

(*Page 1, clause 2*) — Insert the following references at the appropriate places:

<i>'IS No.</i>	<i>Title</i>
2643 : 1975	Dimensions for pipe threads for fastening purposes (<i>first revision</i>)
6392 : 1971	Steel pipe flange'

(*Page 3, clause 4.3.1*) — Substitute the following for the existing:

'4.3.1 In filters with threaded ends for direct connection to the supply line the threads shall comply with IS 554 or IS 2643.'

(*Page 3, clause 4.3.2*) — Substitute the following for the existing:

'Cast iron flanged connections shall comply with IS 6418 and mild steel flanged connections shall comply with IS 6392.'

(FAD 54)

AMENDMENT NO. 3 FEBRUARY 2006
TO
IS 14606 : 1998 IRRIGATION EQUIPMENT— MEDIA
FILTERS — SPECIFICATION

(Page 3, clause 5.3.3, line 1) — Substitute 'three' for 'seven'.

(FAD 17)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Irrigation and Farm Drainage Equipment and System Sectional Committee had been approved by the Food and Agriculture Division Council.

A sand and Gravel Filter (hereinafter called media filter) is basically a tank filled with sand or Gravel of appropriate size and grade. Media filters are especially suitable for micro-irrigation systems because they are three dimensional filter. Media filters are often used with Emitting pipe-systems and with emitter (dripper) systems, particularly where the water is from a surface source such as stream or reservoir. Media filters serve to remove fine suspended organic and inorganic solids such as algae, soil particles, and organic debris.

Media filters are cleaned by Backwashing (by reversing the direction of flow of water through the media). Media filters should be followed by a strainer filter to protect against the possibility of the filter sand finding its way into the irrigation system.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value, should be the same as that of the specified value in this standard.

Indian Standard

IRRIGATION EQUIPMENT — MEDIA FILTERS — SPECIFICATION

SCOPE

This standard specifies the general construction requirements and test method for media filters intended for operation in agricultural irrigation systems.

The standard does not deal with filtration ability, efficiency and capacity (quality of filtered water, time of operation before media filter becomes entirely clogged, etc), nor does it deal with media filters that integrate automatic backwashing devices.

REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute revision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 54 : 1985	Dimensions for pipe threads where pressure tight joints are required on the threads (<i>third revision</i>)
IS 405 (Part 2) : 1980	Industrial sieves : Part 2 Perforated plates (<i>first revision</i>)
IS 500 (Part 1) : 1992	Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection (<i>second revision</i>)
IS 5418 : 1971	Cast iron and malleable cast iron flanges for general engineering purposes
IS 10483 : 1983	Code for designing perforations of industrial plate sieves
IS 2785 : 1994	Irrigation equipment — Strainer type filter (<i>first revision</i>)

TERMINOLOGY

1.0 For the purpose of this standard the following definitions shall apply.

1.1 Media Filter

A filtration device that uses a bed of media to remove suspended organic and inorganic particles from the

incoming irrigation water. Each media filter is contained within a pressure vessel(s) or tank(s) having service openings at the top and side, inlet, outlet and backflush connections that contains underlying drains (for example, PVC plastic, stainless steel, or ceramic materials) with or without a gravel bed to facilitate the Backwashing procedure. Media filter is sometimes referred to as a depth filter.

3.2 Media

The filtration material used in a media filter. The media generally consists of crushed granite, silica, or quartz sieved to specific particle sizes. Media may also consist of many other materials such as cardboard or synthetic fibres, woven textiles of various types, or synthetic particles.

3.3 Clogged Filter Media

A filter which has collected a quantity of solid contaminants, such that it cannot maintain the highest flow rate recommended by the manufacturer without exceeding the safe maximum pressure drop.

3.4 Filter Housing

That part of the media filter that houses all filter components, except for the control equipment, external interconnecting pipe work and complement of control valves.

3.5 Filter Housing Cover

A removable cover permitting assembly, disassembly of Inlet water distributor, filtered water collection system, charging and discharging, renewal of filter media. Cover also acts as deflector for uniform spread of water over media when located at the centre of the media filter.

3.6 Drain Plug (Port)

It is normally provided at the bottom of the filter and should be large enough (about 32 to 50 mm) for flushing out of this opening filtration media, if necessary, using incoming raw material.

3.7 Inlet Deflector/Distributor

It is a means or device fixed inside the filter housing to reduce velocity of incoming raw water, to distribute water evenly over filter bed and to evenly collect Backwash water without restricting Backwashed particulate material.

3.8 Filtered Water Collectors

It is an arrangement provided in the filter housing in the form of false bottom plate with evenly pitched plastic nozzles, or perforated header and with or without laterals, or central header and perforated filter candles so as to collect the filtered water with the normal filter operation and to allow backwash water to be evenly distributed through the filter media when the flow is reversed for the purpose of backwashing.

3.9 Nominal Pressure

The maximum static water pressure immediately upstream of the media filter inlet at which the filter is required to operate.

3.10 Clean Pressure Drop

The pressure drop in a clean media filter measured with a flow of clean water under normal conditions.

3.11 Safe Maximum Pressure Drop

The maximum allowable difference between inlet and outlet pressures across the filter when the filter media has become clogged to the extent of requiring cleaning/backwashing of filter.

3.12 Backwash

A procedure that flushes clean water through a filter tank in reverse direction to the normal operating direction so as to remove captured organic and inorganic particulate from the filter media. Only one tank is usually backwashed at a time. The process is also referred to as backflush and as reverse flushing.

3.13 Backwash Flow

A recommended rate of water flow through the media to maximize uniformity of backwashing, to maximize effectiveness of the backwashing activity, and to minimize loss of media.

3.14 Critical Pressure Drop

The maximum allowable pressure difference across the media filter after which it leads to total blocking.

3.15 Range of Recommended Flow Rate

The range of flow rates declared by the manufacturer for proper operation of the media filter.

3.16 Nominal Size

A conventional numerical designation used to indicate the size of the filter. This designation equals the nominal size of the pipe to which the filter can be connected without reduced fittings.

3.17 Length of Filter

Overall length of the vessel.

3.18 Loading Rate

The average concentration of suspended particulate in the inlet test fluid, expressed in milligrams (dry mass) per litre of test fluid (mg/l).

3.19 Media Grade

The classification of the media with respect to particles and their size distribution (percent of total mass).

3.20 Minimum Operating Flow

The lowest flow into the filter system specified by the manufacturer that ensures both proper filtration and proper backwashing functions. Expressed as flow per unit cross-sectional area of media, $m^3/h/m^2$.

4 TECHNICAL REQUIREMENTS

4.1 General

4.1.1 The parts of media filter that are in contact with the water shall be of non-toxic materials, and shall be resistant to or protected against degradation caused by existing working conditions and types of water used in agricultural irrigation. The filter housing shall also be resistant to environmental conditions. Components belonging to filters of the same size, type and model, and produced by the same manufacturer, shall be replaceable and interchangeable. When made of mild steel, the inside of the vessel shall be suitably powder coated, hot dip galvanized or painted with rubberized paint.

4.1.2 Plastic parts of the filter that are exposed to ultraviolet (UV) radiation under normal working conditions of the filter, shall include additives to improve their resistance to UV radiation. Plastic parts that enclose waterways shall be opaque or shall be provided with an opaque cover design to block all light from reaching clear waterways enclosures.

4.1.3 The construction of the filter shall be such as to ensure its proper installation in its intended location and position.

4.1.4 The filter shall be so designed that after assembly of the filter, all the water flowing through the filter shall flow through the filtering media during normal working and in the reverse direction during backwashing operation.

4.2 Filter Housing (Vessel)

4.2.1 The filter housing (vessel) shall be so designed that the dirt accumulated on the filter media or around the filter candles or plastic nozzles shall not enter the supply line when cleaning or backwashing the filter.

4.2.2 The cover of the filter housing (vessel) shall be attached by means of threads or bolts or in any other manner that ensures full and uniform tightness around the periphery of the cover.

4.2.3 The tolerance on the length of the filter declared by the manufacturer shall be ± 1 percent.

4.2.4 Vessel of one metre and above in length shall be provided with access manhole. Vessels should have supporting stools, inlet/outlet vent connection, compliment of control valves with interconnecting pipe work, sampling taps, pressure gauges to clearly indicate the loss of head through the filter media.

4.3 Connections

4.3.1 In filters with threaded ends for direct connection to the supply line the threads shall comply with IS 554.

4.3.2 Flanged connections shall comply with IS 6418.

4.3.3 The backwash outlet shall be provided with a suitable end connection for the removal of the drained effluent from the site of the media filter.

5 TESTS

5.0 Tests shall be performed with water at a temperature of 20 to 30°C except for test **5.2** where the water temperature shall be $60 \pm 2^\circ\text{C}$. The instruments used for measuring the various parameters shall permit measurements to an accuracy of within ± 2 percent of the actual values.

5.1 Resistance of Filter to Internal Hydrostatic Pressure

5.1.1 This test shall be performed on the filter with all its parts assembled for normal operation.

5.1.2 Before conducting the test on filters equipped with drain valve, open and close the drain valve 100 times while applying a water pressure equal to 0.75 times the normal operating pressure at the inlet.

5.1.3 Close the cover of the filter housing (vessel) in accordance with the manufacturer's catalogue.

5.1.4 Close the outlet of the filter by suitable means. Apply a hydraulic pressure at the inlet of the filter and check that no air remains trapped in the system and that the water reaches all places that may be under pressure during the operation of the filter.

5.1.5 Raise the pressure gradually to 1.5 times the declared nominal pressure and maintain this pressure for one minute.

5.1.5.1 The filter shall withstand the test pressure without suffering damage or deformation.

5.1.5.2 No signs of leakage shall appear through the filter tank (vessel) nor through the connection of the cover to the tank (vessel), nor through the valve or pipe connections.

5.1.5.3 If the gasket of the housing cover swells or is dislodged, reset the same, apply the pressure for an

additional 15 minutes and recheck for leakages. No leakage shall appear through the cover gasket.

5.2 Resistance of Filter to Internal Hydrostatic Pressure at High Temperature

5.2.1 Proceed as described in **5.1.1** to **5.1.4** but fill the tank (vessel) with water at $60 \pm 2^\circ\text{C}$ and raise the internal pressure to the nominal pressure. Maintain the pressure and temperature for 15 minutes.

5.2.1.1 The filter shall withstand the test without showing the signs of leakage.

5.2.2 After completing the test, disassemble the filter and check the parts for damage.

5.2.2.1 The parts of the filter shall show no signs of damage or deformation.

5.3 Pressure Drop vs Flow Testing

Data of pressure drop vs flow shall be reported for the purpose of establishing pressure-flow relationships across the filter system backwash initiation (if necessary) and optimal cycle duration criteria shall follow manufacturer's recommended operating procedures. The specific criteria used for each test period and general test conditions shall be reported. The pressure loss vs flow tests shall be conducted with newly installed, backwashed media.

5.3.1 Test Period

The duration (time) for testing each pressure-flow combination depends on the time required for the entire system to reach conditions of hydraulic equilibrium. These conditions will normally occur after about 20 to 30 min as determined by monitoring pressure and flow fluctuations.

5.3.2 Loading Rate

The filter system shall be tested at each flow with clean water only.

5.3.3 Flows

Tests shall be conducted at a minimum of seven flows ranging in nearly equal increments from about 80 percent of the manufacturer's minimum recommended operating flow per unit area to about 125 percent of the manufacturer's maximum recommended operating flow per unit area. All flows used shall be reported.

5.3.4 Inlet and Outlet Pressures

Inlet pressures shall be maintained at the manufacturer's maximum recommended operating levels. Inlet and outlet pressures shall be reported at each flow once equilibrium conditions have been established.

5.3.5 Testing Sequence

Tests shall proceed from the lowest to the highest flow. backwash, if necessary, to maintain the manufacturer's recommended post-backwash pressure differentials.

6 SAND MEDIA BED SELECTION

6.1 The manufacturer shall supply the information regarding the size and type of bed to achieve the desired water quality. The type and size of filter media to be selected for the application depend upon the type of emitting devices or drip tubing used in the irrigation system, namely, orifice size.

6.1.1 The Sand is Graded by Two Factors:

- a) *Mean effective size* — That size opening of the standard mesh [see IS 2405 (Part 2) and IS 10483] which will pass 10 percent of a representative sample of sand.
- b) *Uniformity coefficient* — A ratio of the size opening of standard mesh that will just pass 60 percent of a representative sample of sand divided by that opening size of the standard mesh which will just pass 10 percent of the same sample [see IS 2405 (Part 2) and IS 10483]. A uniformity coefficient between 1.4 to 1.6 is acceptable for irrigation filter sand grades.

6.2 Sand Designations and Sizes

Information in the tabular (see Table 1) form shall be provided by the manufacturer.

7 SIZING SAND MEDIA FILTER STATIONS

The flow capacity through a media filter is determined by:

- a) media surface area (m²), and
- b) the design flow rate (m³/h/m²)

The manufacturer should specify the recommended Design flow rate range based on contaminant level and contaminant concentration determined as 'suspended solids' from a water analysis (see Table 2).

Table 1 Sand Designation and Sizes
(Clause 6.2)

Sl No.	Effective Sand Size (Mesh Size Passing Through Mesh Size Retained on)	Uniformity Co-efficient	Sand Type (mesh)	Filtration Quality
(1)	(2)	(3)	(4)	(5)

Table 2 Recommended Design Flow Rates
(Clause 7)

Contaminant Level	Contaminant Concentration mg/l (ppm)	Recommended Design Flow Rate Range (m ³ /h/m ²)
(1)	(2)	(3)
Light	0-10	63 - 76
Medium	11-100	50 - 63
Heavy	101-400	43 - 50

8 BACKWASH FLOW

To achieve maximum filter performance, it should be provided with a provision for adjusting backwash to avoid excessive backwash flow rates or insufficient backwash. The manufacturer shall specify the minimum backwash flow rates, for the type of media bed, m³/h.

9 BACK-UP STRAINER FILTER

A back-up strainer filter should be installed immediately downstream of a sand media filter to act as a safety (fuse) screen in the event of sand-media entering into the irrigation system as a result of damage to the media filter under drains or from incorrect operation/installation. As an option a strainer filter conforming to IS 12785 may be provided.

Since the purpose of this strainer filter is not primary filtration, its specification shall be based on sand-media configuration rather than that on water quality. The information in the following tabular (see Table 3) form shall be supplied by the manufacturer.

Table 3 Sand-Media Configuration for Back-Up Strainer Filter

Sl No.	Minimum Grain Size (mm)	Largest Screen Mesh Size Recommended	Mesh Opening (mm)
(1)	(2)	(3)	(4)

10 SAMPLING AND ACCEPTANCE REQUIREMENTS

10.1 Type Tests

The sample of test specimens shall be taken at random from a quantity of at least 20 filters. The number of test specimens required for each test shall be as specified in Table 4.

Table 4 Number of Test Specimens and Acceptance Number
(Clause 10.1)

Clause No.	Name of Test	No. of Test Specimens	Acceptance No.
(1)	(2)	(3)	(4)
5.1	Resistance of filter to internal hydrostatic pressure	3	1 ¹⁾
5.2	Resistance of filter to internal hydrostatic pressure at high temperature	3	1 ¹⁾
5.3	Pressure drop	1	0

¹⁾Refers only to leakage at joints; leakage through the filter tank (vessel) is cause for rejection of the lot.

10.1.1 If the number of defective specimens in the sample does not exceed the acceptance number specified in Table 1, the sample shall be considered as complying with the requirements of this Indian Standard. If the number of defective specimens in the sample is greater than the acceptance number, the sample shall be considered as not complying with the requirement of this Indian Standard.

10.2 Acceptance Test

The test specified in 5.2 shall be only performed as part of type tests.

For acceptance of manufacturing lot or shipment of media filters, the sampling shall be conducted according to IS 2500 (Part 1) based on the AQL 2.5 and special inspection level IV.

For the test specified in 5.1 and 5.3 the shipment or manufacturing lot complies with this standard if number of defective specimens found in the test does not exceed the acceptance number specified in IS 2500 (Part 1).

11 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

The manufacturer shall supply the following information about the media filter:

- Name and address of the manufacturer;
- Model and code number of filter;
- Media Filter data:
 - Material of construction and type of paint or coating;
 - Nominal size;

- Nominal operating pressure;
- Recommended range of design flow rates;
- Dimensions of filter;
- Type of connections to piping network;
- Length for assembly;
- Bed area and depth of filter;
- Mass
 - Tank (Vessel) (Empty)
 - Tank with valves, manifolds and media
- Quantity, size and type of bed;
- Closing of cover instructions; and
- Maximum turbidity level;
- Instructions for assembly, operation, cleaning, backwashing, maintenance, trouble shooting;
- List of spare parts;
- Resistance to chemicals commonly used in irrigation;
- Curve of clean pressure drop in range of recommended flow rates plus 20 percent beyond each end of the range; and
- Maximum allowable differential pressure drop.

12 MARKING

12.1 Each filter shall be marked with the following particulars on filter housing (vessel):

- Name of manufacturer and/or his registered trade-mark,
- Model identification,
- Nominal size,
- Nominal pressure,
- Arrow indicating the inlet and outlet,
- Recommended flow range, and
- Quality of filtration media.

12.2 BIS Standard Marking

Each filter may also be marked with the Standard Mark.

12.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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